



SEQUENCE LISTING

<110> Patten, Phillip
Stemmer, Willem P.C.

<120> METHODS AND COMPOSITIONS FOR POLYPEPTIDE ENGINEERING

<130> 02-020501US

<140> 09/339,926

<141> 1999-06-24

<150> 08/769,062

<151> 1996-12-18

<150> 08/198,431

<151> 1994-02-17

<150> 08/425,684

<151> 1995-04-18

<150> 08/537,874

<151> 1995-10-30

<160> 101

<170> PatentIn Ver. 2.0

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oligonucleotide used for codon usage library

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<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

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aaccctccag ttccgaaccc catatgaaaa aaaccgct 38

<210> 3

<211> 40

<212> DNA

<213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 3
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<210> 4
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 <212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

<400> 4
 aaccctccag ttccgaaccc catatgaaat acctgctgcc gacc 44

<210> 5
 <211> 40
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 oligonucleotide used for codon usage library

<400> 5
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 oligonucleotide used for codon usage library

<400> 6
 tgggtgttatg tctgctcagg cdatggcdgt dgayttypay ctggttccgg ttgaagagga 60

<210> 7
 <211> 60
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

<400> 7
 ggctgggttc gctaccgttg cdcargcdgc dccdaargay ctggttccgg ttgaagagga 60

<210> 8
 <211> 60

<212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

 <400> 8
 caccgccgac gctatctctt cyttygcdc yacyggytcy ctggttccgg ttgaagagga 60

 <210> 9
 <211> 60
 <212> DNA
 <213> Artificial Sequence

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 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 9
 gctgctggct gctcagccgg cdatggcdat ggayatyggy ctggttccgg ttgaagagga 60

 <210> 10
 <211> 61
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 10
 tgccgctgct gttcaccggt gtdacyaarg cdgdcargt dctggttccg gttgaagagg 60
 a 61

 <210> 11
 <211> 60
 <212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

 <400> 11
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 <210> 12
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 12

acgttatcct gttcctgggt gayggyatgg gygtdccdac cgttaccgct acccgatatcc 60

<210> 13

<211> 60

<212> DNA

<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 13

aaactggggtc cggaaacccc dctggcdatg gaycarttyc cgtacgttgc tctgtctaaa 60

<210> 14

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<212> DNA

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oligonucleotide used for codon usage library

<400> 14

ggttccggac tctgctggta cygcdacygc dtayctgtgc ggtgttaaag gtaactaccg 60

<210> 15

<211> 60

<212> DNA

<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 15

ctgctcgta caaccagtgc aaracyacyc gyggyaayga agttacctct gttatgaacc 60

<210> 16

<211> 60

<212> DNA

<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 16

tctgttggtg ttgttaccac yacycgygtd carcaygtd ctccggctgg tgcttacgct 60

<210> 17

<211> 60

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: degenerate

oligonucleotide used for codon usage library

<400> 17
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<210> 18
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 18
acatcgacgt tatcctgggt ggyggycgya artayatggt cccggttggt accccggacc 60

<210> 19
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 19
tctgttaacg gtgttcgtaa rcgyaarc ar aayctggtgc aggcttgga ggctaaacac 60

<210> 20
<211> 60
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 20
gaaccgtacc gctctgctgc argcdgcdga ygaytcytct gttaccacc tgatgggtct 60

<210> 21
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 21
aatacaacgt tcagcaggac cayacyaarg ayccdacyst gcaggaaatg accgaagttg 60

<210> 22
<211> 60
<212> DNA
<213> Artificial Sequence

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 oligonucleotide used for codon usage library

<400> 22
 aacccgcgtg gtttctacct gtttygtgdgar ggyggycgya tcgaccacgg tcaccacgac 60

<210> 23
 <211> 60
 <212> DNA
 <213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 23
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<210> 24
 <211> 60
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

<400> 24
 ccgctgacca ctctcacgtt ttytcttyg gyggytayac cctgcgtggt acctctatct 60

<210> 25
 <211> 60
 <212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

<400> 25
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<210> 26
 <211> 60
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 oligonucleotide used for codon usage library

<400> 26
 cgttaacgac tctacctctg argayccdtc ytaycarcag caggctgctg ttccgcaggc 60

<210> 27

<211> 60
 <212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

 <400> 27
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 <210> 28
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
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 oligonucleotide used for codon usage library

 <400> 28
 atggctttcg ctggttgcgt dgarccdtay acygaytg ya acctgccggc tccgaccacc 60

 <210> 29
 <211> 61
 <212> DNA
 <213> Artificial Sequence

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 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 29
 tgctcacctg gctgcttmac cdccdccdct ggcdctgctg gctggtgcta tgctgctcct 60
 c 61

 <210> 30
 <211> 62
 <212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

 <400> 30
 ttccgcctct agagaattct tartacagrg thgghgccag gaggagcagc atagcaccag 60
 cc 62

 <210> 31
 <211> 58
 <212> DNA
 <213> Artificial Sequence

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 oligonucleotide used for codon usage library

<400> 31
aagcagccag gtgagcagcg tchggratrg argthgcggt ggtcggagcc ggcagggt 58

<210> 32
<211> 60
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 32
cgcaaccagc gaaagccatg atrtghgcha craargtytc ttcttcaaca ccgtgaacca 60

<210> 33
<211> 60
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 33
gcgaaaacag caacgtcttc rccrcrtgr gtytcrghg cctgcggaac agcagcctgc 60

<210> 34
<211> 60
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 34
agaggtagag tcgttaacgt chggrcgrga rccrccrccc agagcgtaac ccggaccgtt 60

<210> 35
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 35
aagatttaga gtccagagct ttrgahgghg ccagrccraa gatagaggta ccacgcaggg 60

<210> 36
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 36
 acgtgagagt ggtcagcggg haccagratc agrgtrtcca gttcagaggt cagttcgtta 60

<210> 37
 <211> 60
 <212> DNA
 <213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 37
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<210> 38
 <211> 60
 <212> DNA
 <213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 38
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<210> 39
 <211> 60
 <212> DNA
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<220>
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 oligonucleotide used for codon usage library

<400> 39
 tcctgctgaa cgttgtattt catrtchgch ggytcraaca gacccatcag gtgggtaaca 60

<210> 40
 <211> 60
 <212> DNA
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<220>
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 oligonucleotide used for codon usage library

<400> 40
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<210> 41
 <211> 60

<212> DNA
 <213> Artificial Sequence

 <220>
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 oligonucleotide used for codon usage library

 <400> 41
 tacgaacacc gttaacagaa gcrtcrtchg grtaytchgg gtccggggta ccaaccggga 60

 <210> 42
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 42
 cccaggataa cgtcgatgtc catrttrtth accagytghg cagcgatgtc ctggcaaccg 60

 <210> 43
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 43
 caggtcagcg tcagagtacc arttrcgrtt hacrgtrtga gcgtaagcac cagccggaga 60

 <210> 44
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 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 44
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 <210> 45
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 45
 cactggttgt aacgagcagc hgcrghacr ccratrgtrc ggtagttacc tttaacaccg 60

<210> 46
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 46
 accagcagag tccggaacct grcgrtchac rttrtargtt ttagacagag caacgtacgg 60

 <210> 47
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 47
 ggggtttccgg acccagttta ccrttcatyt grccyttcag gatacgggta gcggtaacgg 60

 <210> 48
 <211> 60
 <212> DNA
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 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 48
 cccaggaaca ggataacgtt ytthgchgcr gtytgrathg gctgcagttt ttagcaacg 60

 <210> 49
 <211> 42
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

 <400> 49
 acggttccag aaagccgggt cttcctcttc aaccggaacc ag 42

 <210> 50
 <211> 60
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for codon usage library

<400> 50
cctgagcaga cataacacca gchgchachg chachgccag cggcagttta cgcagggtga 60

<210> 51
<211> 62
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 51
accggggtga acagcagcgg cagcaghgcc aghgcratrg trgactgttt catatgtata 60
tc 62

<210> 52
<211> 59
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 52
gccggctgag cagccagcag cagcagrcch gchgchgcgg tcggcagcag gtagtttca 59

<210> 53
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 53
aagagatagc gatcgggggtg gtcaghacra trccagcag tttagcacgc atatgtatat 60

<210> 54
<211> 58
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 54
caacggtagc gaaaccagcc aghgchachg crathgcrat ageggttttt ttcatatg 58

<210> 55
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 55
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<210> 56
 <211> 39
 <212> DNA
 <213> Artificial Sequence

<220>
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 oligonucleotide used for codon usage library

<400> 56
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<210> 57
 <211> 18
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for alpha interferon
 shuffling

<400> 57
 tgtratctgy ctsagacc 18

<210> 58
 <211> 23
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: degenerate
 oligonucleotide used for alpha interferon
 shuffling

<400> 58
 ggcacaaatg vgmagaatct ctc 23

<210> 59
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 <212> DNA
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 oligonucleotide used for alpha interferon
 shuffling

<400> 59

agagattctk cbcatttg tg cc	22
<210> 60	
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<400> 60	
cagttccaga agrctsmagc catc	24
<210> 61	
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gatggctksa gycttctgga actg	24
<210> 62	
<211> 19	
<212> DNA	
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cttcaatctc ttcascaca	19
<210> 63	
<211> 19	
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tgtgstgaag agattgaag	19
<210> 64	
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<212> DNA	

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<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 64

ggawsagass ctcctaga

18

<210> 65

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

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tctaggagss tctswtcc

18

<210> 66

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 66

gaacttdwcc agcaamtgaa t

21

<210> 67

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 67

attcakttgc tggwhaagtt c

21

<210> 68

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon

shuffling

<400> 68
ggactycatc ctggctgtg 19

<210> 69
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 69
cacagccagg atgragtcc 19

<210> 70
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 70
aagaatcact ctttatct 18

<210> 71
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 71
agataaagag tgattctt 18

<210> 72
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 72
tgggaggttg tcagagcag 19

<210> 73
 <211> 19
 <212> DNA
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
 oligonucleotide used for alpha interferon
 shuffling

<400> 73

ctgctctgac aacctccca

19

<210> 74

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
 oligonucleotide used for alpha interferon
 shuffling

<400> 74

tcawtccttm ctcyttaa

18

<210> 75

<211> 166

<212> PRT

<213> consensus alpha interferon

<400> 75

Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
 1 5 10 15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
 20 25 30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
 35 40 45

Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
 50 55 60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Trp Glu Gln Ser
 65 70 75 80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
 85 90 95

Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
 100 105 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
 115 120 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val

130		135		140
Arg Ala Glu Ile Met	Arg Ser Leu Ser Phe	Ser Thr Asn Leu Gln Lys		
145	150	155		160

Arg Leu Arg Arg Lys Asp
165

<210> 76
 <211> 166
 <212> PRT
 <213> human alpha interferon

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Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp														
		20					25					30		

Arg His Asp Phe Gly Leu Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe														
	35					40				45				

Gln Lys Thr Gln Ala Ile Pro Val Leu His Glu Met Ile Gln Gln Thr														
	50				55				60					

Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser														
65				70				75						80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asn Leu														
			85					90					95	

Glu Ala Cys Val Ile Gln Glu Val Gly Met Glu Glu Thr Pro Leu Met														
		100					105					110		

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr														
	115					120					125			

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val														
	130					135				140				

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys														
145				150				155						160

Arg Leu Arg Arg Lys Asp
165

<210> 77
 <211> 166
 <212> PRT
 <213> human alpha interferon

<400> 77														
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1				5				10					15	

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
 20 25 30
 Arg Pro Asp Phe Gly Leu Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
 35 40 45
 Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
 50 55 60
 Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
 65 70 75 80
 Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asn Leu
 85 90 95
 Glu Ala Cys Val Ile Gln Glu Val Gly Met Glu Glu Thr Pro Leu Met
 100 105 110
 Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
 115 120 125
 Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
 130 135 140
 Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
 145 150 155 160
 Ile Leu Arg Arg Lys Asp
 165

<210> 78
 <211> 166
 <212> PRT
 <213> human alpha interferon

<400> 78
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 Leu Leu Ala Gln Met Arg Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
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 Arg His Asp Phe Glu Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
 35 40 45
 Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Met Gln Gln Thr
 50 55 60
 Phe Asn Leu Phe Ser Thr Lys Asn Ser Ser Ala Ala Trp Asp Glu Thr
 65 70 75 80
 Leu Leu Glu Lys Phe Tyr Ile Glu Leu Phe Gln Gln Met Asn Asp Leu
 85 90 95
 Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met

100	105	110
Asn Glu Asp Ser Ile Leu Ala Val Lys Lys Tyr Phe Gln Arg Ile Thr		
115	120	125
Leu Tyr Leu Met Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val		
130	135	140
Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys		
145	150	155
		160
Arg Leu Arg Arg Lys Asp		
	165	

<210> 79

<211> 166

<212> PRT

<213> human alpha interferon

<400> 79

Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
1 5 10 15
Leu Leu Ala Gln Met Gly Arg Ile Ser His Phe Ser Cys Leu Lys Asp
20 25 30
Arg His Asp Phe Gly Phe Pro Glu Glu Glu Phe Asp Gly His Gln Phe
35 40 45
Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
50 55 60
Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
65 70 75 80
Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
85 90 95
Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
100 105 110
Asn Val Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
115 120 125
Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
130 135 140
Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
145 150 155 160
Arg Leu Arg Arg Lys Asp
165

<210> 80

<211> 166

<212> PRT

<213> human alpha interferon

<400> 80

Cys	Asp	Leu	Pro	Gln	Thr	His	Ser	Leu	Gly	His	Arg	Arg	Thr	Met	Met	
1				5					10					15		
Leu	Leu	Ala	Gln	Met	Arg	Arg	Ile	Ser	Leu	Phe	Ser	Cys	Leu	Lys	Asp	
			20					25					30			
Arg	His	Asp	Phe	Arg	Phe	Pro	Gln	Glu	Glu	Phe	Asp	Gly	Asn	Gln	Phe	
		35					40					45				
Gln	Lys	Ala	Glu	Ala	Ile	Ser	Val	Leu	His	Glu	Val	Ile	Gln	Gln	Thr	
	50					55					60					
Phe	Asn	Leu	Phe	Ser	Thr	Lys	Asp	Ser	Ser	Val	Ala	Trp	Asp	Glu	Arg	
65					70					75					80	
Leu	Leu	Asp	Lys	Leu	Tyr	Thr	Glu	Leu	Tyr	Gln	Gln	Leu	Asn	Asp	Leu	
			85						90					95		
Glu	Ala	Cys	Val	Met	Gln	Glu	Val	Trp	Val	Gly	Gly	Thr	Pro	Leu	Met	
			100					105					110			
Asn	Glu	Asp	Ser	Ile	Leu	Ala	Val	Arg	Lys	Tyr	Phe	Gln	Arg	Ile	Thr	
		115					120					125				
Leu	Tyr	Leu	Thr	Glu	Lys	Lys	Tyr	Ser	Pro	Cys	Ala	Trp	Glu	Val	Val	
	130					135					140					
Arg	Ala	Glu	Ile	Met	Arg	Ser	Phe	Ser	Ser	Ser	Arg	Asn	Leu	Gln	Glu	
145					150					155					160	
Arg	Leu	Arg	Arg	Lys	Glu											
				165												

<210> 81

<211> 166

<212> PRT

<213> human alpha interferon

<400> 81

Cys	Asp	Leu	Pro	Gln	Thr	His	Ser	Leu	Arg	Asn	Arg	Arg	Ala	Leu	Ile	
1				5					10					15		
Leu	Leu	Ala	Gln	Met	Gly	Arg	Ile	Ser	Pro	Phe	Ser	Cys	Leu	Lys	Asp	
			20					25					30			
Arg	His	Glu	Phe	Arg	Phe	Pro	Glu	Glu	Glu	Phe	Asp	Gly	His	Gln	Phe	
		35					40					45				
Gln	Lys	Thr	Gln	Ala	Ile	Ser	Val	Leu	His	Glu	Met	Ile	Gln	Gln	Thr	
	50					55					60					
Phe	Asn	Leu	Phe	Ser	Thr	Glu	Asp	Ser	Ser	Ala	Ala	Trp	Glu	Gln	Ser	

65		70		75		80
Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu						
	85			90		95
Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met						
	100		105		110	
Asn Glu Asp Phe Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr						
	115		120		125	
Leu Tyr Leu Met Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val						
	130		135		140	
Arg Ala Glu Ile Met Arg Ser Phe Ser Phe Ser Thr Asn Leu Lys Lys						
	145		150		155	160
Gly Leu Arg Arg Lys Asp						
	165					

<210> 82
 <211> 166
 <212> PRT
 <213> human alpha interferon

<400> 82
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
1 5 10 15
Leu Leu Ala Gln Met Arg Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
20 25 30
Arg His Asp Phe Glu Phe Pro Gln Glu Glu Phe Asp Asp Lys Gln Phe
35 40 45
Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
50 55 60
Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Leu Asp Glu Thr
65 70 75 80
Leu Leu Asp Glu Phe Tyr Ile Glu Leu Asp Gln Gln Leu Asn Asp Leu
85 90 95
Glu Ser Cys Val Met Gln Glu Val Gly Val Ile Glu Ser Pro Leu Met
100 105 110
Tyr Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
115 120 125
Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Ser Cys Ala Trp Glu Val Val
130 135 140
Arg Ala Glu Ile Met Arg Ser Phe Ser Leu Ser Ile Asn Leu Gln Lys
145 150 155 160

Arg Leu Lys Ser Lys Glu
165

<210> 83

<211> 166

<212> PRT

<213> human alpha interferon

<400> 83

Cys Asp Leu Pro Glu Thr His Ser Leu Asp Asn Arg Arg Thr Leu Met
1 5 10 15

Leu Leu Ala Gln Met Ser Arg Ile Ser Pro Ser Ser Cys Leu Met Asp
20 25 30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
35 40 45

Gln Lys Ala Pro Ala Ile Ser Val Leu His Glu Leu Ile Gln Gln Ile
50 55 60

Phe Asn Leu Phe Thr Thr Lys Asp Ser Ser Ala Ala Trp Asp Glu Asp
65 70 75 80

Leu Leu Asp Lys Phe Cys Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
85 90 95

Glu Ala Cys Val Met Gln Glu Glu Arg Val Gly Glu Thr Pro Leu Met
100 105 110

Asn Ala Asp Ser Ile Leu Ala Val Lys Lys Tyr Phe Arg Arg Ile Thr
115 120 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
130 135 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Leu Ser Thr Asn Leu Gln Glu
145 150 155 160

Arg Leu Arg Arg Lys Glu
165

<210> 84

<211> 166

<212> PRT

<213> human alpha interferon

<400> 84

Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
1 5 10 15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
20 25 30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe

35	40	45
Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr		
50	55	60
Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ile Trp Glu Gln Ser		
65	70	75
Leu Leu Glu Lys Phe Ser Thr Glu Leu Asn Gln Gln Leu Asn Asp Met		
	85	90
		95
Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met		
	100	105
		110
Asn Val Asp Ser Ile Leu Ala Val Lys Lys Tyr Phe Gln Arg Ile Thr		
	115	120
		125
Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val		
	130	135
		140
Arg Ala Glu Ile Met Arg Ser Phe Ser Leu Ser Lys Ile Phe Gln Glu		
145	150	155
		160
Arg Leu Arg Arg Lys Ser		
	165	

<210> 85

<211> 166

<212> PRT

<213> human alpha interferon

<400> 85

Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile		
1	5	10
		15
Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp		
	20	25
		30
Arg Pro Asp Phe Gly Leu Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe		
	35	40
		45
Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr		
	50	55
		60
Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser		
65	70	75
		80
Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asn Leu		
	85	90
		95
Glu Ala Cys Val Ile Gln Glu Val Gly Met Glu Glu Thr Pro Leu Met		
	100	105
		110
Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr		
	115	120
		125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
 130 135 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
 145 150 155 160

Ile Leu Arg Arg Lys Asp
 165

<210> 86
 <211> 166
 <212> PRT
 <213> human alpha interferon

<400> 86
 Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
 1 5 10 15

Leu Leu Ala Gln Met Gly Arg Ile Ser His Phe Ser Cys Leu Lys Asp
 20 25 30

Arg Tyr Asp Phe Gly Phe Pro Gln Glu Val Phe Asp Gly Asn Gln Phe
 35 40 45

Gln Lys Ala Gln Ala Ile Ser Ala Phe His Glu Met Ile Gln Gln Thr
 50 55 60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Trp Asp Glu Thr
 65 70 75 80

Leu Leu Asp Lys Phe Tyr Ile Glu Leu Phe Gln Gln Leu Asn Asp Leu
 85 90 95

Glu Ala Cys Val Thr Gln Glu Val Gly Val Glu Glu Ile Ala Leu Met
 100 105 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
 115 120 125

Leu Tyr Leu Met Gly Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
 130 135 140

Arg Ala Glu Ile Met Arg Ser Phe Ser Phe Ser Thr Asn Leu Gln Lys
 145 150 155 160

Gly Leu Arg Arg Lys Asp
 165

<210> 87
 <211> 501
 <212> DNA
 <213> consensus alpha interferon

<400> 87
 tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60

atgggaagaa	tctctccttt	ctcctgcctg	aaggacagac	atgacttttg	atttccccag	120
gaggagtgtg	atggcaacca	gttccagaag	gctcaagcca	tctctgtcct	ccatgagatg	180
atccagcaga	ccttcaatct	cttcagcaca	aaggactcat	ctgctgcttg	ggatgagagc	240
ctcctagaaa	aattttccac	tgaactttac	cagcaactga	atgacctgga	agcctgtgtg	300
atacaggagg	ttgggggtgga	agagactccc	ctgatgaatg	aggactccat	cctggctgtg	360
aggaaatact	tccaaagaat	cactctttat	ctgacagaga	agaaatacag	cccttgtgcc	420
tgggaggttg	tcagagcaga	aatcatgaga	tccttctctt	tttcaacaaa	cttgcaaaaa	480
agattaagga	ggaaggattg	a				501

<210> 88

<211> 501

<212> DNA

<213> human alpha interferon

<400> 88

tgtgatctgc	ctcagaccca	cagcctgggt	aataggaggg	ccttgatact	cctggcacaa	60
atgggaagaa	tctctccttt	ctcctgcctg	aaggacagac	atgacttttg	acttccccag	120
gaggagtgtg	atggcaacca	gttccagaag	actcaagcca	tccctgtcct	ccatgagatg	180
atccagcaga	ccttcaatct	cttcagcaca	gaggactcat	ctgctgcttg	ggaacagagc	240
ctcctagaaa	aattttccac	tgaactttac	cagcaactga	ataacctgga	agcatgtgtg	300
atagaggagg	ttgggatgga	agagactccc	ctgatgaatg	aggactccat	cctggctgtg	360
aggaaatact	tccaaagaat	cactctttat	ctaacagaga	agaaatacag	cccttgtgcc	420
tgggaggttg	tcagagcaga	aatcatgaga	tccctctctt	tttcaacaaa	cttgcaaaaa	480
agattaagga	ggaaggattg	a				501

<210> 89

<211> 501

<212> DNA

<213> human alpha interferon

<400> 89

tgtgatctgc	ctcagaccca	cagcctgggt	aataggaggg	ccttgatact	cctggcacaa	60
atgggaagaa	tctctccttt	ctcctgcctg	aaggacagac	ctgacttttg	acttccccag	120
gaggagtgtg	atggcaacca	gttccagaag	actcaagcca	tctctgtcct	ccatgagatg	180
atccagcaga	ccttcaatct	cttcagcaca	gaggactcat	ctgctgcttg	ggaacagagc	240
ctcctagaaa	aattttccac	tgaactttac	cagcaactga	ataacctgga	agcatgtgtg	300
atacaggagg	ttgggatgga	agagactccc	ctgatgaatg	aggactccat	cctggctgtg	360
aggaaatact	tccaaagaat	cactctttat	ctaacagaga	agaaatacag	cccttgtgcc	420
tgggaggttg	tcagagcaga	aatcatgaga	tctctctctt	tttcaacaaa	cttgcaaaaa	480
atattaagga	ggaaggattg	a				501

<210> 90

<211> 501

<212> DNA

<213> human alpha interferon

<400> 90

tgtaatctgt	ctcaaaccce	cagcctgaat	aacaggagga	ctttgatgct	catggcacaa	60
atgaggagaa	tctctccttt	ctcctgcctg	aaggacagac	atgactttga	atttccccag	120
gaggaatttg	atggcaacca	gttccagaaa	gctcaagcca	tctctgtcct	ccatgagatg	180
atgcagcaga	ccttcaatct	cttcagcaca	aagaactcat	ctgctgcttg	ggatgagacc	240
ctcctagaaa	aattctacat	tgaacttttc	cagcaaatga	atgacctgga	agcctgtgtg	300
atacaggagg	ttgggggtgga	agagactccc	ctgatgaatg	aggactccat	cctggctgtg	360
aagaaatact	tccaaagaat	cactctttat	ctgatggaga	agaaatacag	cccttgtgcc	420
tgggaggttg	tcagagcaga	aatcatgaga	tccctctctt	tttcaacaaa	cttgcaaaaa	480
agattaagga	ggaaggattg	a				501

<210> 91
 <211> 501
 <212> DNA
 <213> human alpha interferon

<400> 91
 tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
 atgggaagaa tctctccttt ctcatgcctg aaggacagac atgatttcgg attccccgag 120
 gaggagtttg atggccacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
 atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
 ctctagaaa aattttccac tgaactttac cagcaactga atgacctgga agcatgtgtg 300
 atacaggagg ttgggggtgga agagactccc ctgatgaatg tggactccat cctggctgtg 360
 aggaaatact tccaaagaat cactctttat ctaacagaga agaaatacag cccttgtgcc 420
 tgggaggttg tcagagcaga aatcatgaga tccctctcgt tttcaacaaa cttgcaaaaa 480
 agattaagga ggaaggattg a 501

<210> 92
 <211> 501
 <212> DNA
 <213> human alpha interferon

<400> 92
 tgtgatctgc ctcagaccca cagcctgggt cacaggagga ccatgatgct cctggcacaa 60
 atgaggagaa tctctccttt ctctgtctg aaggacagac atgacttcag atttccccag 120
 gaggagtttg atggcaacca gttccagaag gctgaagcca tctctgtcct ccatgagggtg 180
 attcagcaga ccttcaatct cttcagcaca aaggactcat ctgttgcttg ggatgagagg 240
 cttctagaca aactctatac tgaactttac cagcagctga atgacctgga agcctgtgtg 300
 atgcaggagg tgtgggtggg agggactccc ctgatgaatg aggactccat cctggctgtg 360
 agaaaatact tccaaagaat cactctctac ctgacagaga aaaagtacag cccttgtgcc 420
 tgggaggttg tcagagcaga aatcatgaga tccttctctt catcaagaaa cttgcaagaa 480
 aggttaagga ggaaggaata a 501

<210> 93
 <211> 501
 <212> DNA
 <213> human alpha interferon

<400> 93
 tgtgatctgc ctcagaccca cagcctgcgt aataggaggg ccttgatact cctggcacaa 60
 atgggaagaa tctctccttt ctctgtctg aaggacagac atgaattcag attcccagag 120
 gaggagtttg atggccacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
 atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
 ctctagaaa aattttccac tgaactttac cagcaactga atgacctgga agcatgtgtg 300
 atacaggagg ttgggggtgga agagactccc ctgatgaatg aggactccat cctggctgtg 360
 aggaaatact tccaaagaat cactctttat ctaatggaga agaaatacag cccttgtgcc 420
 tgggaggttg tcagagcaga aatcatgaga tccttctctt tttcaacaaa cttgaaaaaa 480
 ggattaagga ggaaggattg a 501

<210> 94
 <211> 501
 <212> DNA
 <213> human alpha interferon

<400> 94
 tgtgatctgc ctcagactca cagcctgggt aacaggaggg ccttgatact cctggcacaa 60
 atgcgaagaa tctctccttt ctctgcctg aaggacagac atgactttga attccccag 120
 gaggagtttg atgataaaca gttccagaag gctcaagcca tctctgtcct ccatgagatg 180

```

atccagcaga ccttcaacct cttcagcaca aaggactcat ctgctgcttt ggatgagacc 240
cttctagatg aattctacat cgaacttgac cagcagctga atgacctgga gtcctgtgtg 300
atgcaggaag tgggggtgat agagtctccc ctgatgaatg aggacttcat cctggctgtg 360
aggaaatact tccaaagaat cactctatat ctgacagaga agaaatacag ctcttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tatcaatcaa cttgcaaaaa 480
agattgaaga gtaaggaatg a                                     501

```

<210> 95

<211> 501

<212> DNA

<213> human alpha interferon

<400> 95

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tgtgatctcc ctgagaccca cagcctggat aacaggagga ccttgatgct cctggcacaa 60
atgagcagaa tctctccttc ctctgtctg atggacagac atgactttgg atttccccag 120
gaggagtttg atggcaacca gttccagaag gctccagcca tctctgtcct ccatgagctg 180
atccagcaga ctttcaacct cttctccaca aaagattcat ctgctgcttg ggatgaggac 240
ctcctagaca aattctgcac cgaactctac cagcagctga atgacttggg agcctgtgtg 300
atgcaggagg agaggggtggg agaaactccc ctgatgtacg cggactccat cctggctgtg 360
aagaaatact tccaaagaat cactctctat ctgacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tatcaacaaa cttgcaagaa 480
agattaagga ggaaggaata a                                     501

```

<210> 96

<211> 501

<212> DNA

<213> human alpha interferon

<400> 96

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tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctctgcctg aaggacagac atgactttgg atttccccaa 120
gaggagtttg atggcaacca gttccagaag gctcaagcca tctctgtcct ccatgagatg 180
atccagcaga ctttcaatct cttcagcaca aaggactcat ctgctacttg ggaacagagc 240
ctcctagaaa aattttccac tgaacttaac cagcagctga atgacatgga agcctgcgtg 300
atacaggagg ttgggggtgga agagactccc ctgatgaatg tggactctat cctggctgtg 360
aagaaatact tccaaagaat cactctttat ctgacagaga agaaatacag cccttgtgct 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tatcaaaaat ttttcaagaa 480
agattaagga ggaaggattg a                                     501

```

<210> 97

<211> 501

<212> DNA

<213> human alpha interferon

<400> 97

```

tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctctgcctg aaggacagac ctgactttgg acttccccag 120
gaggagtttg atggcaacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
atccagcaga ctttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
ctcctagaaa aattttccac tgaactttac cagcaactga ataacctgga agcatgtgtg 300
atacaggagg ttgggatgga agagactccc ctgatgaatg aggactccat cttggctgtg 360
aggaaatact tccaaagaat cactctttat ctaacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tctctctctt tttcaacaaa cttgcaaaaa 480
agattaagga ggaaggattg a                                     501

```

<210> 98

<211> 501

<212> DNA

<213> human alpha interferon

<400> 98

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tgtgatctgc ctcagactca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctcattt ctctgcctg aaggacagat atgatttcgg attccccag 120
gaggtgtttg atggcaacca gttccagaag gctcaagcca tctctgcctt ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca aaggattcat ctgctgcttg ggatgagacc 240
ctcctagaca aattctacat tgaacttttc cagcaactga atgacctaga agcctgtgtg 300
acacaggagg ttgggggtgga agagattgcc ctgatgaatg aggactccat cctggctgtg 360
aggaaatact ttcaaagaat cactctttat ctgatggaga agaaatacag cccttgtgcc 420
tgggagggtg tcagagcaga aatcatgaga tccttctctt tttcaacaaa cttgcaaaaa 480
ggattaagaa ggaaggattg a 501
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<210> 99

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Protease
peptide substrate

<400> 99

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Arg Gly Val Val Asn Ala Ser Ser Arg Leu Ala
  1             5             10
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<210> 100

<211> 44

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Introduced Sfi
I site

<400> 100

```
ttccatttca tacatggccg aaggggccgt gccatgagga tttt 44
```

<210> 101

<211> 50

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Introduced sfi
I site

<400> 101

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ttctaaatgc atgttggcct ccttggccgg attctgagcc ttcaggacca 50
```